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(54) Centrifugal pump.

(57) The invention concerns a centrifugal pump for pumping polluted liquids.

The pump comprises an impeller (6) of a so-called closed type having two cover discs (11) and (12) respectively and vanes (13) therebetween. The inner parts of the vanes (13) cooperate with cutting means (5) within the pump inlet, while the lower cover disc (12) together with a non-rotating insert part (4) in the pump inlet create a radial seal, which prevents medium from entering beside of the impeller (6).

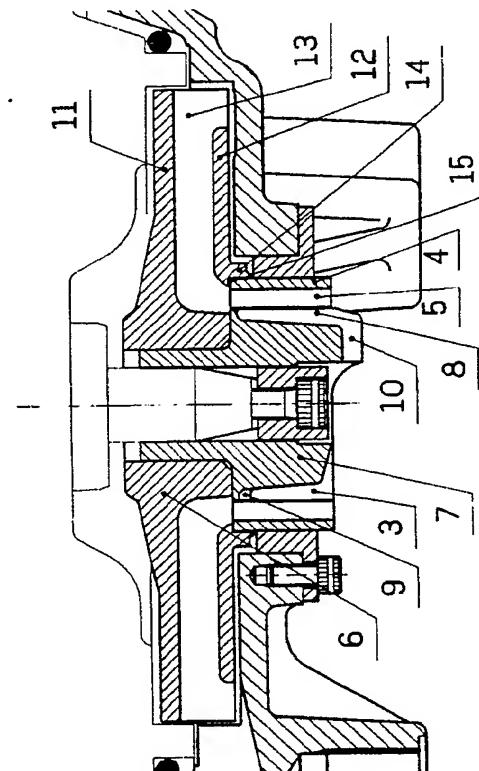


Fig. 2

CENTRIFUGAL PUMP

This invention concerns a centrifugal pump for pumping liquids containing solid bodies, such as rags and other elongated objects.

The centrifugal pump, which sucks the liquid into its center and throws it outwards in the direction of the periphery, has good qualities when pumping clean liquids. When the liquid contains solid bodies, however, the problem arises that these may get stuck between the pump impeller and the surrounding pump housing and cause a stop or at least a decreased pumping ability.

A way to solve these problems is to design the pump in such a way that the impeller rotates beside the flow itself, so-called vortex impellers. By this the clogging problems may be essentially solved, however, at the cost of other disadvantages, such as a decreased efficiency.

Another way to solve the problems, is to arrange some form of cutting means in front of the impeller which cuts rags and the like and makes them possible to pump. An example of such a solution is shown in the US Pat No 4 108 386.

In the known construction the front end of the impeller is provided with two cutting means which cooperate with the inlet of the impeller for cutting the pollutions. It turns out, however, that the under pressure in the pump inlet makes an incoming rag to get sucked into the center of the impeller. Smaller rags may then rotate together with the impeller without making contact with the cutting means. Bigger rags may cause an increasing rotary resistance, sometimes to such a degree that the pump stops.

Another construction is shown in the Swedish published patent application No 444 969. Here a central body with cutting means is arranged, which body fills up the space in the inlet, thus diminishing the risk for the rags being sucked into the impeller center. This solution is normally working very well, but under certain conditions a rag may stick to the center of the impeller and get stretched outwards to the periphery between the impeller and the housing. The friction which derives from that might lead to an overload of the motor and release of the motor protection device.

The two described impellers have in common that they are both of the so-called open type. This means that the impeller has got only one cover disc on which the vanes are mounted and that the impeller is open towards the cutting means. This embodiment depends on the fact that the prevailing opinion has been that only open impellers are possible to use when pumping strongly polluted liquids.

The closed impeller, which is provided with two

cover discs and vanes therebetween, has above all the advantage that its efficiency is far better than that of an open impeller.

According to the invention, use of a closed impeller when pumping strongly polluted liquids has been made possible. This possibility brings about better efficiency and a longer bearing life time. In addition it gives a better cutting result, thus diminishing the risks for clogging and damage.

The invention is more closely described below with reference to the enclosed drawings.

Fig 1 shows a section view of a submersible pump provided with a device according to the invention, while Fig 2 shows the device in more detail. Fig 3 and 4 show two sections of the impeller.

In the drawings 1 stands for a pump with a pump housing 2 having an inlet opening 3 with an insert part 4 provided with grooves 5. 6 stands for a centrifugal impeller with inlet, hub 7, primary cutting means 8, secondary cutting means 9 and projections 10. 11 and 12 stand for the upper and lower cover discs respectively of the impeller 6. 13 stands for vanes, while 14 and 15 stand for collars on the lower cover disc 12.

The pump impeller 6 is thus designed with a cylinder-formed hub 7, which extends downwards into the inlet opening of the pump housing 2. A number of cutting means 8, 9 are arranged on the inlet 7, which cooperate with axially directed grooves 5 in the inlet opening to cut pollutions in the water to be pumped.

The impeller is further designed with two cover discs 11 and 12 and intermediate vanes 13. The cover disc 12, which is heading the pump inlet 3, stops a certain distance from the hub 7 thus creating a ringformed opening around the hub, through which opening the pumped medium is sucked into the impeller.

Pollutions in the liquid shall, as previously mentioned, be cut between the cutting means 8, 9 and the grooves 5. The vanes 13 and the insert part 4 provided with the grooves 5 with its end surface create together another cutting means which effectively mills the pollutions. When mounting, the insert part 4 is brought into contact with the inner parts of the vanes 13, which gives a suitable cutting distance, when the impeller starts rotating. An additional advantage with the invention is thus that a correct distance between impeller and insert part is easily and automatically obtained.

In order to secure that the entire amount of cut material is brought into the impeller through the ring-formed opening, the cover disc 12 is provided with a collar 14, which surrounds the upper end of

the insert part 4, thus obtaining a radial seal. This seal, which may have a length of between 3 and 6 mm, prevents effectively material from entering along the underside of the cover disc 12 and cause clogging. A similar radial seal is created between the collar 14 and the part of the pump housing 2, which is situated radially outside said collar.

According to a special embodiment the lower cover disc 12 is provided with a collar 15, which extends a distance inwards over the insert part 4, thus creating an axial seal which additionally decreases the risk for the cut material being fed below the cover disc 12.

By help of the invention a pump is obtained which has very good qualities when pumping strongly polluted liquids. As compared with previously used open impellers, the closed impeller has a far better efficiency. In addition the risks for clogging and over-load of the driving motor are considerably reduced as all material is cut close to the center of the impeller. This means shorter lever arms for the forces and thus less torque. Finally there is no risk for collection of braking material between the impeller and the bottom of the pump housing.

Claims

1 A centrifugal pump for pumping liquids containing solid bodies and pollutions such as rags and other elongated objects and comprising a pump housing (2) having a central inlet (3) and a rotating impeller (6) provided with cutting means (8), (9), which cooperate with an insert part (4) within the pump inlet (3) which insert part (4) is provided with grooves (5) in such a way that a cutting takes place between the cutting means and the edges of the grooves (5), characterized in that the impeller (6) is designed as a closed impeller having upper and lower cover discs (11) and (12) respectively and intermediate vanes (13).

2 A centrifugal pump according to claim 1, characterized in that the lower cover disc (12) is provided with a collar (14) which surrounds the end of the insert part (4) heading the impeller (6), thus creating a radial seal.

3 A centrifugal pump according to claim 1, characterized in that the lower cover disc (12) is provided with a collar (14) which together with the part of the pump housing (2) radially surrounding said collar creates a radial seal.

4 A centrifugal pump according to claim 1, characterized in that the lower cover disc (12) is provided with a collar (15) which extends a distance inwards over the insert part (4), thus creating an axial seal between those parts.

5 A centrifugal pump according to claim 1,

characterized in that parts of the vanes (13), which are close to the hub (7) of the impeller (6) create cutting means in cooperation with the end of the insert part (4) heading the impeller (6).

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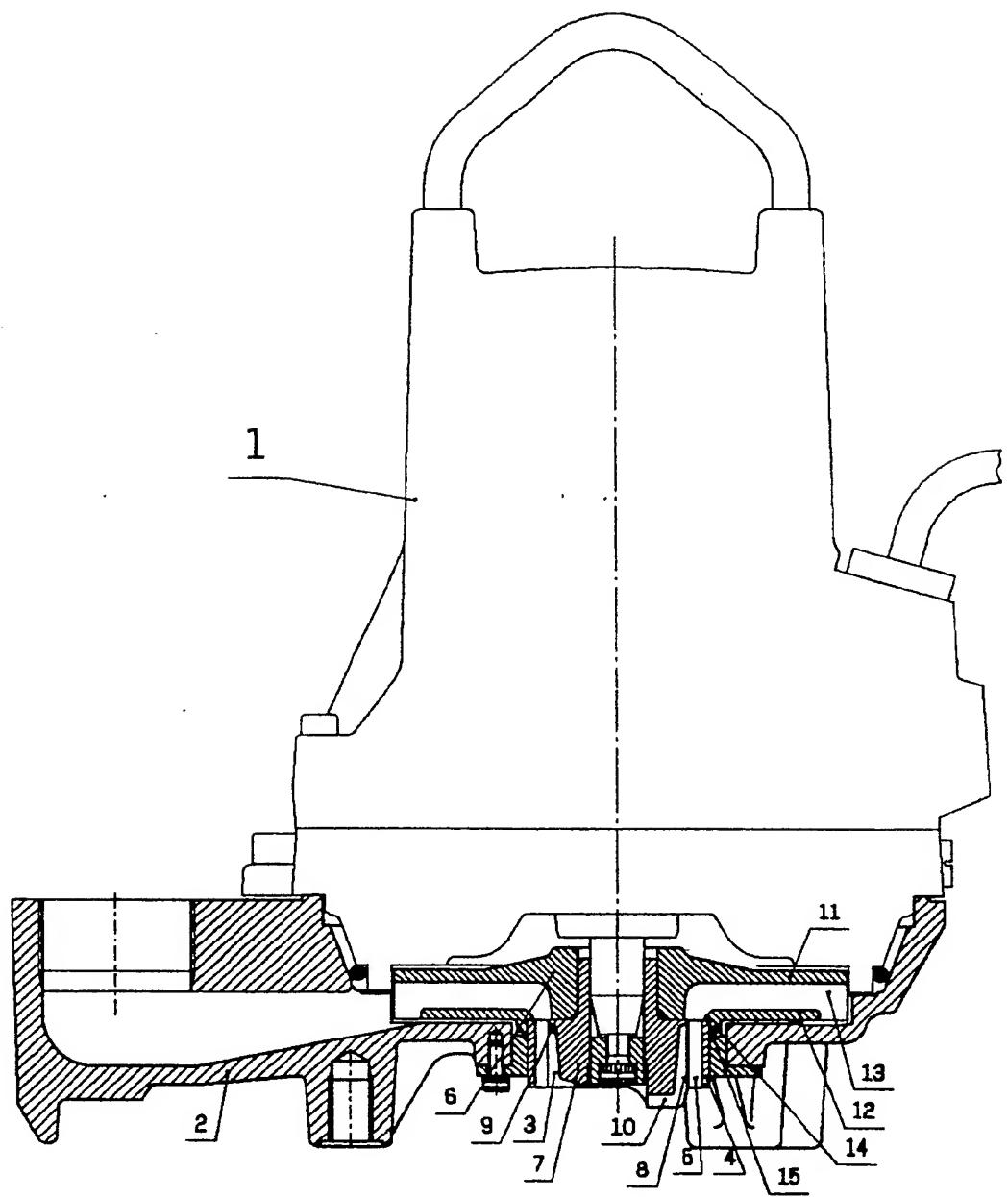


Fig.1

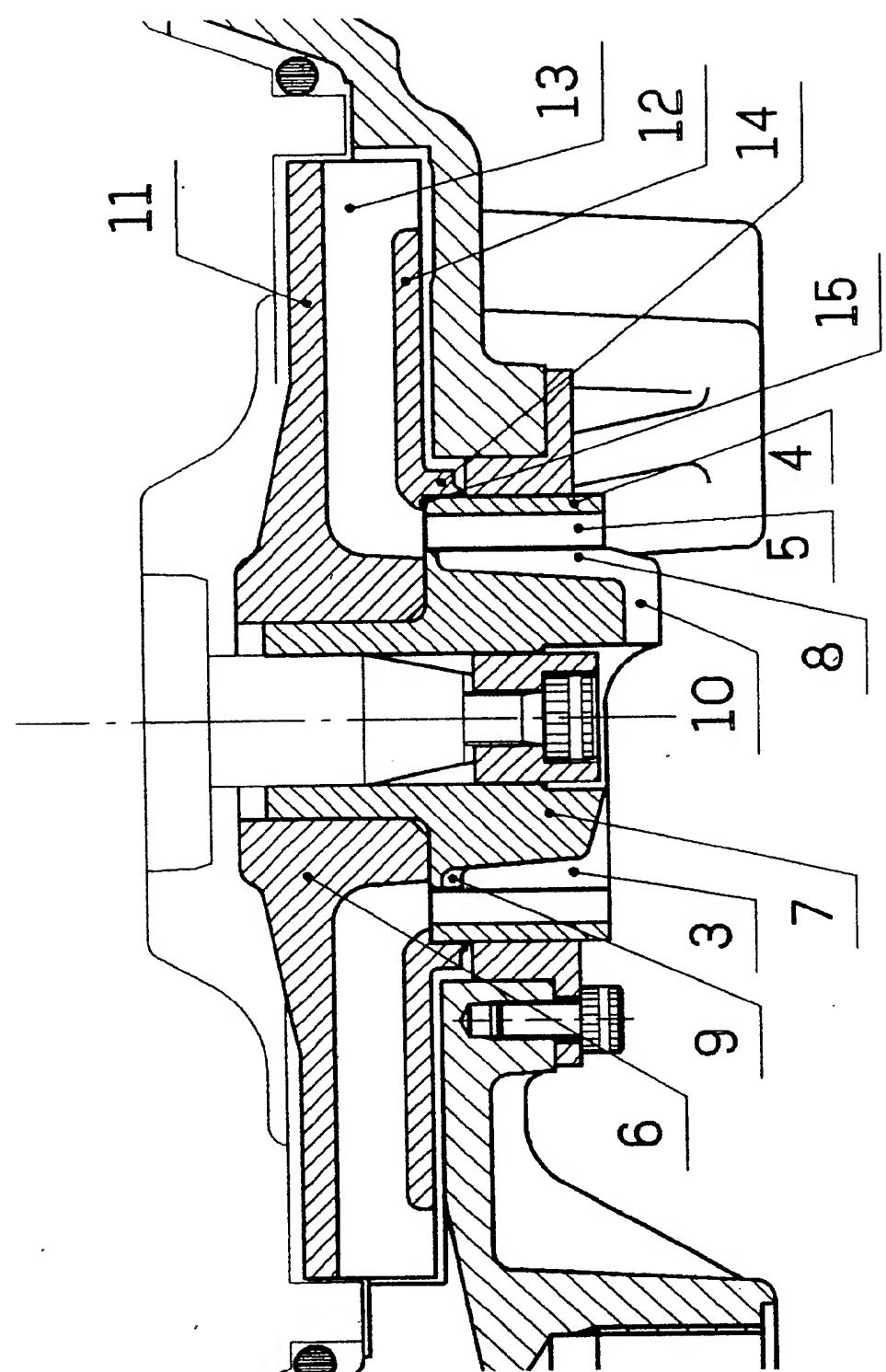


Fig. 2

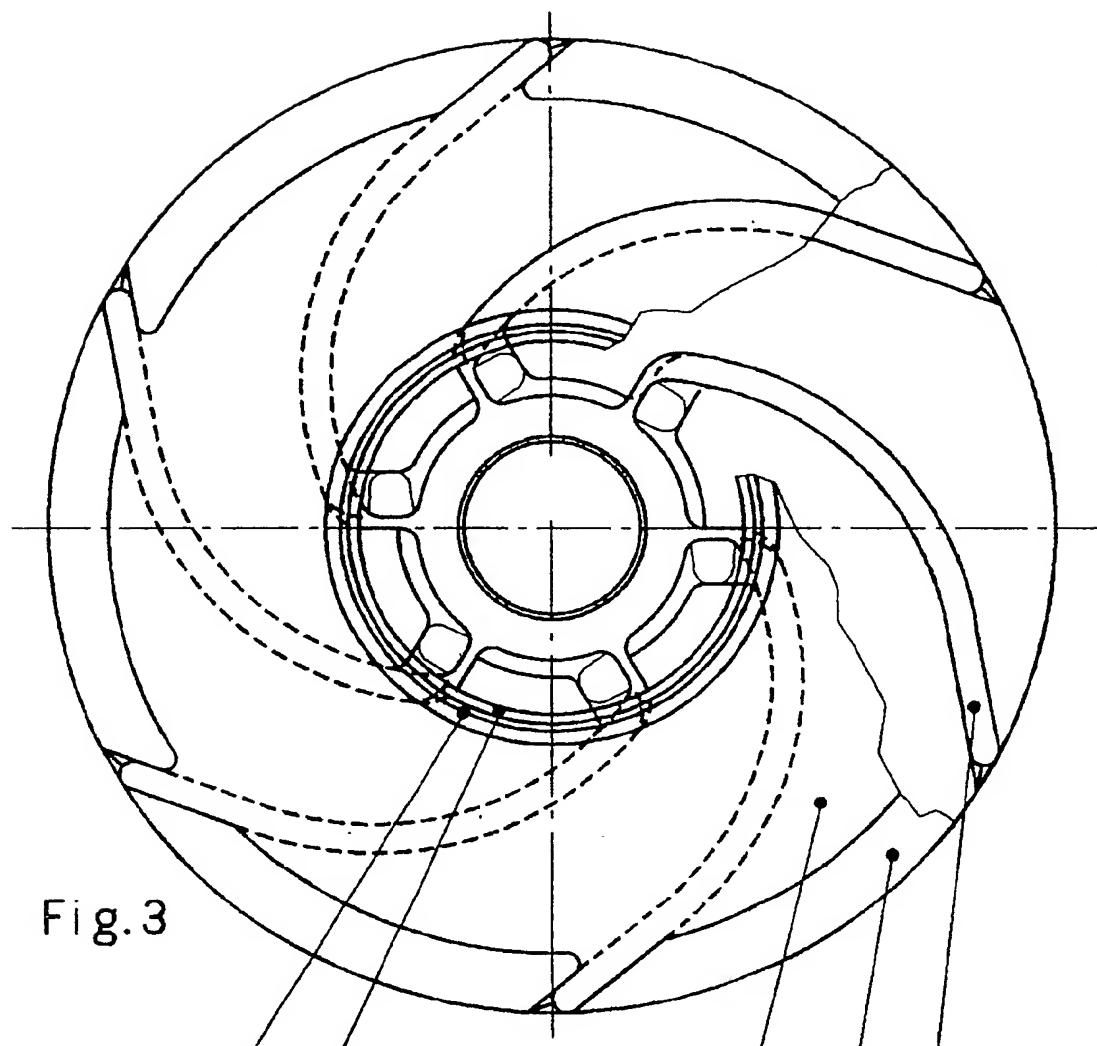


Fig. 3

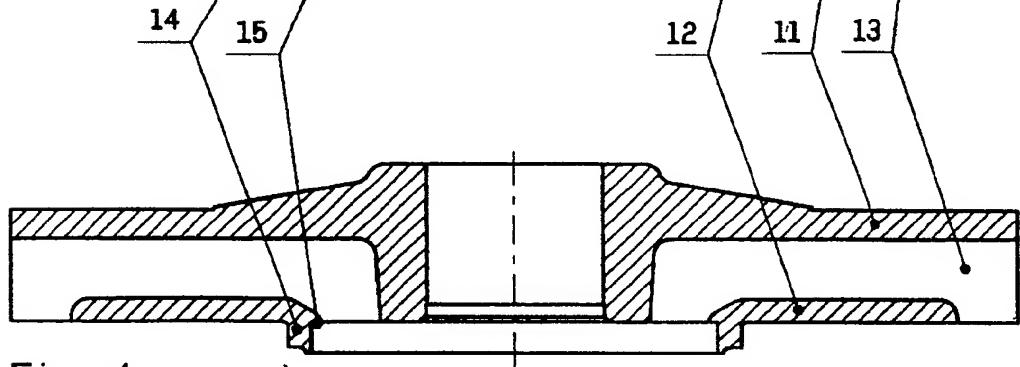


Fig. 4



EP 90 85 0102

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	GB-A-1551918 (CHITTENDEN) * page 1, lines 87 - 94 * * page 2, lines 22 - 65 * * page 2, line 117 - page 3, line 5; figures 1, 3, 4 * ---	1	F04D29/22 F04D7/04
A		2, 3, 5	
X	FR-A-2185275 (AHLSTROM) * page 1, lines 1 - 12 * * page 2, lines 10 - 23; figure 1 * ---	1	
A	EP-A-120178 (FLYGT) * page 1, lines 1 - 2 * * page 2, line 7 - page 3, line 8; figures * ---	1, 5	
A	FR-A-594899 (G. ET WEIR) * page 1, lines 1 - 19 * * page 1, line 40 - page 2, line 16; figures * ---	2-4	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			F04D
The present search report has been drawn up for all claims			
1	Place of search THE HAGUE	Date of completion of the search 16 JULY 1990	Examiner ZIDI K.
CATEGORY OF CITED DOCUMENTS			
<p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			